CLAIMS

1.   A loudspeaker system suitable for a confined space including:

an electro-acoustic transducer having a relatively low value of Qt, wherein Qt denotes total quality factor of resonant behaviour of said electro-acoustic transducer, including electrical and mechanical quality factors;

an enclosure having a second order topology for said electro-acoustic transducer which is naturally inclined to produce a rising acoustic response for said system at a second order rate, said enclosure having means adapted to interface said confined space to modify the rate of rise of said response relative to said second order rate such that said response is attenuated relative to said second order rate but is accentuated relative to a substantially flat response, within a substantial part of a passband of said system at least at a selected frequency or frequencies; and

means included in an electrical path driving said electro-acoustic transducer for equalizing said rising response to provide extended dynamic headroom at least at said selected frequency or frequencies.

2.   A loudspeaker system according to claim 1 wherein said second order rate is substantially 12dB/octave and said attenuated response is not more than substantially 9dB/octave.

3.   A loudspeaker system according to claim 1 or 2 wherein said attenuated response is substantially 6dB/octave.

4.   A loudspeaker system according to claim 1, 2 or 3 wherein said interface means includes a first acoustic filter.

5.   A loudspeaker system according to claim 4 wherein said first acoustic filter includes a helmholtz resonator.

6.   A loudspeaker system according to claim 4 or 5 wherein said first acoustic filter is adapted to filter harmonics out of said acoustic response to reduce distortion.

7.   A loudspeaker system according to any one of the preceding claims wherein said selected frequency or frequencies is/are near a higher frequency end of said passband.

8.   A loudspeaker system according to any one of the preceding claims wherein said enclosure includes backwave barrier means adapted to exclude from said confined space sound generated from a side of said transducer opposing said space.

9.   A loudspeaker system according to claim 8 wherein said backwave barrier means includes an acoustically leaky element.

10.   A loudspeaker system according to claim 8 wherein said backwave barrier means includes a sealed or acoustically leaky cavity built into a motor vehicle.

11.   A loudspeaker system according to claim 10 wherein said backwave barrier means includes a wall of a trunk of said vehicle.

12.   A loudspeaker system according to claim 10 or 11 wherein said backwave barrier means includes a rear parcel shelf of said vehicle.

13.   A loudspeaker system according to any one of claims 9 to 12 wherein said leaky element causes at least partial sound field cancellation outside of said confined space.

14.   A loudspeaker system according to any one of the preceding claims wherein said equalizing means is adapted to attenuate said rising response at least at said selected frequency or frequencies.

15.   A loudspeaker system according to any one of the preceding claims wherein said equalizing means includes a two pole filter.

16.   A loudspeaker system according to any one of the preceding claims wherein such equalizing means is included with an inverter amplifier combination used for driving said electro-acoustic transducer.

17.   A loudspeaker system according to any one of claims 4 to 16 wherein said first acoustic filter interacts with a first side of said electro-acoustic transducer and including a second acoustic filter adapted to interact with a second side of said electro-acoustic transducer opposing said first side.

18.   A loudspeaker system according to claim 17 wherein said second acoustic filter is adapted to modify phase and/or amplitude of a backwave generated by said electro-acoustic transducer.

19.   A loudspeaker system according to claim 17 or 18 wherein said second acoustic-filter is adapted to enhance cancellation of a sound field attributable to said system that is external to said space.

20.   A method of extending output of a loudspeaker system suitable for a confined space, said method including:

providing an electro-acoustic transducer having a relatively low value of Qt, wherein Qt denotes total quality factor of resonant behaviour of said electro-acoustic transducer including electrical and mechanical quality factors;

providing an enclosure having a second order topology for said electro-acoustic transducer which is naturally inclined to produce a rising acoustic response for said system at a second order rate;

interfacing said enclosure to said confined space to modify said rising response relative to said second order rate such that said response is attenuated relative to said second order rate but is accentuated relative to a substantially flat response, within a substantial part of a passband of said system at least at a selected frequency or frequencies; and

electrically equalizing said rising response to provide extended dynamic headroom at least at said selected frequency or frequencies.

21.   A method according to claim 20 wherein said second order rate is substantially 12dB/octave and said attenuated response is not more than substantially 9dB/octave.

22.   A method according to claim 20 or 21 wherein said attenuated response is substantially 6dB/octave.

23.   A method according to claim 18, 19 or 20 wherein said interfacing is performed via a first acoustic filter.

24.   A method according to claim 23 wherein said first acoustic filter includes a helmholtz resonator.

25. A method according to claim 23 or 24 wherein said first acoustic filter is adapted to filter harmonics out of said acoustic response to reduce distortion.

26. A method according to any one of claims 20 to 25 wherein said selected frequency or frequencies is/are near a higher frequency end of said passband.

27. A method according to any one of claims 20 to 26 wherein said enclosure includes backwave barrier means adapted to exclude from said confined space sound generated from a side of said transducer opposing said space.

28. A method according to claim 27 wherein said backwave barrier means includes an acoustically leaky element.

29. A method according to claim 27 wherein said backwave barrier means includes a sealed or acoustically leaky cavity built into a motor vehicle.

30. A method according to claim 29 wherein said backwave barrier means includes a wall of a trunk of said vehicle.

31. A method according to claim 29 or 30 wherein said backwave barrier means includes a rear parcel shelf of said vehicle.

32. A method according to any one of claims 28 to 31 including utilizing said leaky element to at least partially cancel a sound field attributable to said system that is external to said confined space.

33. A method according to any one of claims 20 to 32 wherein said equalizing is adapted to attenuate said rising response at least at said selected frequency or frequencies.

34. A method according to any one of claims 20 to 33 wherein said equalizing is performed via a two pole filter.

35. A method according to any one of claims 20 to 34 wherein such equalizing is performed by means included with an inverter amplifier combination used for driving said electro-acoustic transducer.

36.   A method according to any one of claims 23 to 35 wherein said first acoustic filter interacts with a first side of said electro-acoustic transducer and including providing a second acoustic filter adapted to interact with a second side of said electro-acoustic transducer opposing said first side.

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37.   A method according to claim 36 wherein said second acoustic filter is adapted to modify phase and/or amplitude of a backwave generated by said electro-acoustic transducer.

10   38.   A method according to claim 36 or 37 wherein said second acoustic-filter is adapted to enhance cancellation of a sound field attributable to said system that is external to said space.

39.   A loudspeaker system substantially as herein described with reference to Figs.
15   2 to 6 of the accompanying drawings.

40.   A method of extending output of a loudspeaker system substantially as herein described with reference to Figs. 2 to 6 of the accompanying drawings.